REMARKS

Reconsideration of this application is requested.

Claims 1, 5 and 6 have been amended by replacing the reference to "Mw" by "weight average molecular weight" as suggested by the Examiner. Accordingly, withdrawal of the Section 112, 2nd ¶ rejection is requested.

The multiple dependency of claims has also been corrected and other minor changes which are thought to improve form have been made in claims 8 and 9.

The claim changes are highlighted in the attached Appendix.

With respect to the Examiner's comments in Section 4 of the action, it is noted that the subject matter of the various claims was commonly owned at the time the inventions covered therein were made.

The Examiner is respectfully requested to reconsider the Section 103(a) rejection of claims 1-3 and 5-12 as unpatentable over EP 732381 alone, or alternatively, in view of either Yang (U.S. 5,825,391) or Lent et al (U.S. 5,837,042) as set out in Section 5 of the action. The cited references do not make the applicants' invention obvious.

The problem addressed by the present invention is to provide stable aqueous ink jet printing inks that may be used in both piezo and thermal ink jet printers. The key aspect in achieving this objective is the provision of a composition as defined in the claims comprising a water dissipatable polyurethane. The importance of including a water-dissipatable polyurethane having a weight average molecular weight of less than 25,000 is illustrated in Comparative Examples C1 and C2 (pages 12 to 14 of the specification). Ink C2 completely lacks a water-dissipatable polyurethane and ink C1 is based on a high molecular weight polyurethane (the

weight average molecular weight of the polyurethane in Necrez R961 is 70,000 to 100,000). Table 1 shows that when these comparative inks were used in an ink jet printer ink, C1 did not fire and ink C2 was unstable to storage. Thus, according to the applicants' invention, an effective composition must comprise a water-dissipatable polyurethane having a weight average molecular weight of less than 25,000.

If a person of ordinary skill consulted EP 732381, they would learn that certain polymer particles could be incorporated into ink-jet inks and so enable the ink to form a coating film at room temperature. However, to arrive at the present invention starting from EP 732381, a person of ordinary skill would have to:

(a) decide that the weight average molecular weight of the polyurethane described in EP 732381 must be less than 25,000;

(b) decide that the polyurethane described in EP 732381 should be water dissipatable; and

(c) decide that the composition must include both a water-miscible and water-immiscible solvent.

There is nothing in EP 732381 which would even remotely motivate a person of ordinary skill to take any one of the above steps or suggest that by taking these steps, they would arrive at an ink-jet composition able to work effectively in both thermal and piezo ink-jet printers.

The Examiner has suggested that there are two key differences between the present application and EP 732381. These are:

(a) the average molecular weight of polyurethane; and

(b) the amount of water-immiscible organic solvent and the viscosity of the ink.

With regard to the molecular weight, the Examiner has cited Yang et al as teaching the use of water dissipatable polyurethanes of molecular weight less than 25,000 in aqueous ink-jet inks. With all respect, it is submitted that this is not so. Yang et al, in Col. 2, line 51, clearly states that the invention therein is concerned with solvent based inks. Thus, a person of ordinary skill in formulating aqueous ink-jet printing inks would not be motivated to consult Yang et al. If a person of ordinary skill did consult Yang et al, the reference does not teach the use of water dissipatable polyurethane. Therefore, a person of ordinary skill would not be motivated at all by the preferred molecular weight range in Yang et al of 5,000 to 50,000 which they would see as only being relevant to a polyurethane suitable for use in a solvent based ink-jet printing ink.

The Examiner also argues that Lent et al teach 4,000 to 12,000 as a preferred molecular weight range for polyurethanes for use in invisible fluorescent ink-jet printing inks. However, in Lent et al, the use of polyurethane is suggested as only one of a long list of possible binders. In addition, none of the preferred monomers listed in Lent et al (see Col. 10, lines 42 to 51) would lead to the formation of water dissipatable polyurethane. Thus, if a person of ordinary skill were to consider Lent et al, they would not be motivated to use a water dissipatable polyurethane of Mw less than 25,000.

The Examiner has also argued that it would be obvious to a person of ordinary skill to limit the molecular weight of the polyurethane in light of the known tendency of polymer solutions to increase in viscosity with increasing molecular

weight of the polymer. However, the present applicants submit that the viscosity depends on many factors such as the shape of the polymer and the nature of the solvent. In addition, the present invention is not limited to solutions since, as taught on page 3, lines 28 to 30, a water dissipatable polyurethane may form a solution, dispersion, emulsion or suspension. Thus, it would not be obvious for a person of ordinary skill to limit the molecular weight of the water dissipatable polyurethane to 25,000 simply to decrease the viscosity of the ink-jet printing ink.

With regard to the amount of water-immiscible organic solvent present, with respect, it is noted that an important aspect of the present claims is that if the composition is to have its desired properties, it should comprise both water-miscible and water-immiscible solvent. In EP 732381, page 9, lines 7 to 14, there is a list of individual solvents. Some of the solvents are water-miscible, others are water-immiscible and solvents. However, there is no indication that any of these solvents should be mixed and, in particular, there is no indication that a water-miscible and water-immiscible solvent mixture results in advantageous properties.

For all of the above reasons, it is submitted that the applicants' invention as defined in claims 1-3 and 5-12 is not obvious from the EP reference, with or without Yang or Lent et al. Clearly, the EP reference would not motivate one of ordinary skill in the art to make the changes required in the EP composition to reach the applicants' invention and there, similarly, is no motivation in Yang or Lent et al to do so. Accordingly, withdrawal of the Section 103(a) rejection based on these references is in order and is requested.

Reconsideration of the Section 103(a) rejection of claims 1, 2, 4-6 and 7-9 as unpatentable over Knable et al (U.S. 4,532,276) in view of either Yang (U.S. 5,825,391) or Lent et al (U.S. 5,837,042) is also requested.

As indicated earlier, the applicants' invention is directed towards providing compositions suitable for use in an ink-jet printer. As set out on page 1, lines 6 to 13 of the applicants' specification, a development of a composition for this purpose represents a significant challenge since the composition has to be able to fire through a nozzle that is typically half the diameter of a human hair. Existing inks for writing and drawing do not work satisfactorily in ink-jet printers.

Knable et al disclose an ink, particularly a writing or drawing ink, comprising a polyurethane as a binder. A person of ordinary skill would not expect these inks to work in an ink-jet printer and so would not be motivated to consult this art. Even if one did consult Knable et al, nothing therein would lead a person of ordinary skill to select a water-dissipatable polyurethane of weight average molecular weight less than 25,000. If a person of ordinary skill used another polyurethane, such as a high molecular weight polyurethane as shown in Comparative Example C1 on page 14 of the present application, they would arrive at a composition which would not work in or meet the demanding performance requirements of ink-jet printing.

A person of ordinary skill in formulating aqueous ink-jet printing compositions would not be motivated to consult Yang et al which is concerned with providing non-aqueous inks. Even if the person of ordinary skill did consult Yang et al, the reference does not teach the use of water dissipatable polyurethane. In fact, nothing in Yang even remotely suggests that aqueous compositions for ink-jet printing can be beneficially formed utilizing water dissipatable polyurethane.

Thus, in short, if a person of ordinary skill consulted both Knable et al and Yang et al, they would not be motivated to devise a composition according to the present claims.

Lent et al does not fill in the deficiencies of the other references. Lent et al is concerned with providing an invisible fluorescent ink-jet printing ink. Nowhere in Lent et al is there any teaching or suggestion of the use of a water-dissipatable polyurethane in a composition for ink-jet printing. Thus, if a person of ordinary skill consulted both Knable et al and Lent et al, they would not be motivated to device a composition according to the present invention.

For all of the above reasons, it is submitted that the Examiner's Section 103(a) rejection as set out in Section 6 of the action should be withdrawn.

The same is true for the rejection of claims 1-4, 6 and 9 as unpatentable over Batlaw et al (U.S. 5,429,841) in view of either Yang (U.S. 5,825,391) or Lent et al (U.S. 5,837,042) as set out in Section 7 of the action. These references do not make the subject matter of claims 1-4, 6 and 9 obvious.

More specifically, Batlaw et al are concerned with a printing ink emulsion for Gravure printing. As such, it is in a completely different field with different formulation requirements to ink-jet printing. In particular, in Gravure printing, the ink is not fired through a nozzle. Thus, a person of ordinary skill would not consult Batlaw et al if concerned with ink-jet printing. However, if one did decide to consult Batlaw et al, the reference would not teach or even remotely suggest compositions according to the present claims containing water dissipatable polyurethanes of MW < 25,000.

Yang et al and Lent et al have been discussed and distinguished above. Consideration of either of these references with Batlaw is not in any sense suggestive of the applicants' invention.

Consistent with the foregoing, the applicants consider that their claims define patentably over the prior art. Accordingly, favorable reconsideration with allowance is requested.

Respectfully submitted,

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APPENDIX

Version with Markings to Show Changes Made

IN THE CLAIMS

The claims are being amended as follows:

1. (Amended) A composition comprising water-dissipatable polyurethane having a [Mw] weight average molecular weight less [that] than 25,000, water, colorant, a water-miscible organic solvent and a water-immiscible organic solvent.

3. (Amended) A composition according to [any one of the preceding claims] claim 1 wherein the colorant is soluble in the polyurethane.

4. (Amended) A composition according to [any one of the preceding claims] claim 1 wherein the water-immiscible organic solvent is benzyl alcohol.

5. (Amended) A composition according to [any one of the preceding claims] claim 1 comprising:

(f) from 0.5 to 50 parts of a water-dissipatable polyurethane having a weight average molecular weight less than 25,000;

(g) from 0.1 to 20 parts of colorant;

(h) from 40 to 90 parts of water;

(i) from 2 to 30 parts of a water-immiscible organic solvent; and

(j) from 2 to 60 parts of a water-miscible organic solvent;

wherein all parts are by weight and the total number of parts of (a) + (b) + (c) + (d) + (e) add up to 100.

6. (Amended) A composition according to [any one of the preceding claims] claim 1 wherein the polyurethane has an weight average molecular weight from 1,000 to 15,000.

7. (Amended) A composition according to [any one of the preceding claims] claim 1 having a viscosity less than 20cp at 20°C.

8. (Amended) A composition according to [any one of the preceding claims] claim 1 which has been filtered through a filter having a mean pore size below 10μm.

9. (Amended) An ink comprising a composition according to [any one of the preceding claims] claim 1.

10. (Amended) An ink jet printing ink comprising a composition according to [any one of the preceding claims] claim 1.

11. (Amended) A process for printing an image on a substrate comprising applying thereto a composition according to [any one of the preceding claims] claim 1 by means of an ink jet printer.

12. (Amended) An ink jet printer cartridge containing a composition according to [any one of claims 1 to 10] claim 1.